LONGBOW APACHE

Army ACAT IC Program		**Prime Contractor**
Total Number of Systems:	501	Boeing
Total Program Cost (TY$):	$8.76B	
Average Unit Cost (TY$):	$11.3M	
Full-rate production:	1QFY96	

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

The AH-64D Longbow Apache is a remanufactured and upgraded version of the AH-64A Apache attack helicopter. The primary modifications to the Apache are the addition of a millimeter-wave Fire Control Radar (FCR) target acquisition system, the fire-and-forget Longbow Hellfire air-to-ground missile, updated T700-GE-701C engines, and a fully integrated cockpit. In addition, the aircraft has improved survivability, communications, and navigation capabilities. Most existing capabilities of the AH-64A Apache are retained.

The AH-64D is being fielded in two configurations. The full-up AH-64D includes all of the improvements listed above. The other version of the AH-64D does not have FCR, Radar Frequency Interferometer, or the improved engines. The AH-64D without FCR is more affordable, yet remains capable of employing Longbow Hellfire missiles autonomously or in cooperation with the FCR-equipped AH-64. Five hundred and one AH-64A Apaches in the fleet are to be upgraded to the AH-64D configuration; approximately half (227) will be equipped with the FCR.

The mission of the attack helicopter is to conduct rear, close, and deep operations; deep precision strike; and armed reconnaissance and security when required in day, night, or adverse weather conditions. The AH-64D is a ***dominant maneuver*** platform that leverages ***information superiority*** and ***tactical precision engagement*** to provide ***full-dimensional protection*** for the ground maneuver force.

BACKGROUND INFORMATION

The combined Longbow Apache and Longbow Hellfire IOT&E was conducted in four phases: (1) gunnery; (2) force-on-force; (3) air transportability; and (4) aircraft conversion. The gunnery phase of IOT&E was conducted from January-February 1995, at the Naval Weapons Center, China Lake, CA. Testing conducted at Ft. Hunter Liggett, CA, during March 1995, compared the Longbow Apache armed with the Longbow and Semi-Active Laser missiles with the baseline AH-64A. Both the test and baseline attack helicopter companies conducted missions against a battalion-sized enemy ground force augmented with formidable air defenses, while a real-time casualty assessment system imposed realistic friendly and enemy losses. Air transportability and aircraft conversion demonstrations were conducted at the contractor facility.

One issue uncovered during IOT&E that required Follow-on Testing (FOT) involved a method of employment for the Longbow Hellfire missile. During IOT&E's force-on-force phase, Longbow Apache crews frequently overrode the system's automatic firing mode selection and fired missiles from a masked position using the Lock-On Before Launch Inhibit (LOBL-I) firing mode. This technique significantly increased the helicopter's survivability during IOT&E, but had not been validated with live missile firings during preceding DT/OT.

The DAB authorized full-rate production of the aircraft and radar in October 1995. The attendant ADM, dated October 18, 1995, required OSD approve the Army's plan to test the LOBL-I mode of engagement. The ADM also stated that testing would culminate with missile firings at moving targets.

The first Longbow Apache equipped battalion, the 1-227th, completed the Unit Fielding and Training Program in November 1998 at Ft. Hood, TX. The second Longbow Apache battalion, the 2-101st, achieved Initial Operational Capability in October 1999 at Ft. Campbell, KY. A third battalion is undergoing initial training and should complete fielding in November 2000.

TEST & EVALUATION ACTIVITY

OSD (DOT&E) worked with the Army to develop a plan for a FOT of the LOBL-I engagement to confirm system performance using this firing technique. The test program included digital simulations of the missile's target acquisition and fly-out, Hardware-in-the-Loop (HWIL) testing of the guidance section, Low-speed Captive Fight Test (LSCFT) of the missile seeker, and live missile firings at moving armored vehicles. The simulations, LSCFT, and four of the planned eight missile firings were completed in FY99. Missile firings suspended to address some software anomalies surfacing as a result of testing were completed in August 2000.

TEST & EVALUATION ASSESSMENT

IOT&E and LFT&E were conducted in accordance with the approved TEMP (September 1994). As reported to Congress in the October 1995 B-LRIP report and Live Fire Test report, these tests were adequate to provide the information necessary to determine the system operationally effective, suitable, and survivable. Specifically, AH-64D was found to be substantially more effective than the AH-64A in its IOT&E. During the gunnery phase, AH-64D was able to acquire and effectively engage targets in obscuration that precluded engagement by the AH-64A. During force-on-force testing, the AH-64D force was significantly more lethal and survivable than the AH-64A force.

The Longbow Apache was also found to be suitable for fielding. The system met its reliability and maintainability requirements although several objectives were not achieved. AH-64D operational availability compared favorably with the AH-64A, although the system fell short of wartime availability objectives.

The LOBL-I FOT, conducted in accordance with the OSD approved plan, was a remarkably innovative use of Modeling and Simulation (M&S) to support OT&E. In this instance, M&S was used to characterize the missile's performance in the LOBL-I mode in a far wider range of conditions than could be examined using just field testing. Factors such as target range and time delay (the time between locating the target and firing the missile) were varied based on what was observed during the IOT&E force-on-force test results. Only after the M&S results were analyzed were informative cases selected for LSCFT and live fire missile shots. The results from the LSCFT and the missile firings were then compared to the M&S predictions to help further validate the simulation models. This was a noteworthy example of field test results (from the IOT&E) supporting M&S (digital, HWIL, and LSCFT)—the results of which supported field testing (live missile shots).

The LOBL-I FOT was suspended on shot four of eight live missile shots scheduled because of software anomalies (high number of unexplained false returns on possible targets). Once the software anomalies were resolved, the conditions on shot number four were tested again to confirm the software fix. The LOBL-I FOT then continued with shots five through eight. Initial observations of the test data suggest the test met its objective of confirming accurate characterization of the missile's performance in the LOBL-I mode. A detailed analysis of the test data will confirm these results.

Taken in their entirety, data from digital and HWIL simulations, LSCFT, and missile firings quantified key factors significantly affecting the missile's probability of acquiring and hitting the target when fired in the LOBL-I mode. These factors include target range, time delay (the time between locating the target and firing the missile), target radial velocity (target speed and aspect angle), and the ability of the missile software to reject background clutter when searching for higher speed targets at longer ranges.